

Product Stewardship Summary Sodium Hypochlorite

Summary

Sodium hypochlorite is a greenish yellow liquid with a faint chlorine-like odor. The term “hypochlorite” refers to the salts of hypochlorous acid (HOCl). Since the acid is extremely unstable, most users handle the more stable hypochlorite solutions instead. These salts are prepared in solution by reacting chlorine with a strong alkali, such as caustic soda, or an alkaline earth hydroxide. Sodium hypochlorite (NaOCl) solution is commonly known as household bleach. At stronger concentrations, it is used for bleaching paper, pulp, and textiles. Other applications include use as a chemical intermediate for the manufacture of organic chemicals, in water purification, in medicine, in fungicides, in swimming pool disinfectants and as a germicide.

1. Chemical Identity

Name: Sodium hypochlorite
Synonyms: Chlorine bleach, Soda bleach, Household Bleach
Chemical Abstracts Service (CAS) number: 7681-52-9
Chemical Formula: Cl-O.Na
Molecular Weight: 74.44

2. Production

The common method for making sodium hypochlorite is to react chlorine with a solution of caustic soda. The final concentration of the sodium hypochlorite solution depends on the initial concentration of the starting caustic soda solution. The following equation gives the chemical reaction involved, regardless of concentration:



3. Uses

Sodium hypochlorite is used as a disinfectant; a water treatment agent in swimming pool water, drinking water, waste water and sewage, and pulp and paper mill process water; and as a bleaching agent for textiles.

4. Physical and Chemical Properties

Sodium hypochlorite is generally sold in aqueous solutions containing 5 to 15% sodium hypochlorite, with 0.25 to 0.35% free alkali (usually NaOH) and 0.5 to 1.5% NaCl. Solutions of up to 40% sodium hypochlorite are available, but solid sodium hypochlorite is not commercially used. Sodium hypochlorite

solutions are a clear, greenish yellow liquid with an odor of chlorine. **Odor may not provide an adequate warning of hazardous concentrations.** Sodium hypochlorite solutions can liberate dangerous amounts of chlorine or chloramine if mixed with acids or ammonia. Anhydrous sodium hypochlorite is very explosive. Hypochlorite solutions should be stored at a temperature not exceeding 20°C (68 °F) away from acids in well-fitted air-tight bottles away from sunlight.

Hazardous Decomposition Products: Chlorine and hydrogen chloride

Conditions to Avoid: Avoid heat, flames, sparks and other sources of ignition. Avoid exposure to direct sunlight. Avoid contact with metals.

5. Health Effects

- May cause eye irritation (possibly severe), chemical burns, eye damage, and blindness.
- Skin contact may be irritating and corrosive.
- Inhalation may cause coughing, choking, irritation and pulmonary edema.
- Ingestion may cause irritation, corrosion of gastrointestinal tract, pain and vomiting.
- Carefully controlled sensitization studies on animals have not resulted in any reproducible positive findings. Standard sensitization patch tests in healthy human volunteers show no potential to induce contact sensitization.
- In tests using rats and mice, there was no evidence of carcinogenicity.

6. Environmental Effects

Sodium hypochlorite may adversely affect aquatic life. This material is inorganic and not subject to biodegradation. This material is believed not to bioconcentrate in aquatic systems.

Before disposing of any significant volumes of aqueous solutions of sodium hypochlorite to any sanitary discharge system or receiving body of water, contact the local environmental regulating agency and/or plant management first. Proper neutralization is critical because sodium hypochlorite can seriously disrupt sewage or other treatment plant operations resulting in failure of the biological or chemical treatment processes. In addition, waste streams containing sodium hypochlorite may come into contact with acidic conditions and chlorine gas may be released.

7. Exposure

Sodium hypochlorite is corrosive and causes severe skin burns, serious eye damage, and damage to the respiratory system if inhaled. The most likely ways exposures could occur are:

- Worker exposure – Exposure could occur in the manufacturing facility or in industrial facilities that use sodium hypochlorite. When exposures occur, they are typically by inhalation of vapors. Exposure to skin or eyes, causing severe irritation or chemical burns, could also occur. Good industrial hygiene practices and the use of personal protective equipment minimize the risk of exposure.
- Consumer exposure – OxyChem does not sell sodium hypochlorite directly into the retail market.
- Releases – If a spill occurs, emergency personnel should wear protective equipment to minimize exposures.

8. Recommended Risk Management Measures

Prior to using sodium hypochlorite, carefully read and comprehend the Material Safety Data Sheet. The following are some risk management measures that are effective against the hazards of sodium hypochlorite:

- Refer to technical references and handbooks to ensure proper selection of materials used to process, store, and/or transfer sodium hypochlorite. Few materials of construction will withstand the highly reactive nature of sodium hypochlorite. Improper selection of those materials may result in damage to the handling system and contamination of the product. As a general rule, no metals should be allowed to come in contact with this chemical.
- Store sodium hypochlorite solutions in the original, labeled container.
- Industrial users of sodium hypochlorite should store it in vented containers, or in containers equipped with adequate relief devices. If venting rate is exceeded by the decomposition rate, swelling or damage to the container may occur.
- Use closed systems when possible to prevent worker exposure. Provide local exhaust ventilation where vapors, mist or aerosols may be generated.
- Work areas where sodium hypochlorite is used should be well ventilated to maintain concentrations below exposure limits. If exposures exceed accepted limits or if respiratory discomfort is experienced, use a NIOSH approved full-face air purifying respirator with high efficiency particle air (HEPA) cartridges. Acid gas cartridges may be required if decomposition products are present. If concentrations are unknown or at or above 10 mg/m³, an approved self-contained breathing apparatus operated in the pressure demand mode is required.
- Wear chemical safety goggles with a faceshield to protect against eye and skin contact when appropriate. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.
- Wear chemical resistant gloves made of natural rubber, neoprene, nitrile, or polyvinyl chloride (PVC) to prevent skin contact.
- Wear chemical resistant clothing to prevent contact with the body.

9. Regulatory Compliance Information

The following is a summary of regulations and guidelines that may pertain to Sodium Hypochlorite (additional regulations and guidelines may apply):

- Under the Comprehensive Environmental Resource and Conservation Liability Act (CERCLA), any release of 100 pounds (45.4 kilograms) or more of sodium hypochlorite to the environment within a 24-hour period, not specifically allowed by a permit, must be reported to the National Response Center (NRC).
- Sodium hypochlorite is regulated by the U.S. Department of Transportation (DOT).
- Sodium hypochlorite is subject to the Community Right-to-Know Reporting Requirements in 40 CFR Section 370, Subpart B.
- In the United States, sodium hypochlorite solutions that are labeled and used for disinfection and/or sanitization are pesticides regulated by the U.S. Environmental Protection Agency under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). All states, and some local governments, have laws requiring the registration of pesticides.

- The OSHA Permissible Exposure Level for sodium hypochlorite is 2 mg/m³ averaged over an 8 hour period.
- The American Conference of Governmental Industrial Hygienists Ceiling Threshold Limit Value for sodium hypochlorite is 2 mg/m³.

10. Sources for Additional Information

- American Chemistry Council website: <http://www.americanchemistry.com>
- Hazardous Substances Data Bank (HSDB), HSDB Number 748, Last revision date: March 5, 2003.
- OxyChem Product Handbook web site:
http://www.oxy.com/Our_Businesses/chemicals/Documents/sodium_hypochlorite/bleach.pdf
- OxyChem Material Safety Data Sheet web site:
http://www.oxy.com/Our_Businesses/chemicals/Pages/chem_products_msds_search.aspx
- Registry of Toxic Effects of Chemical Substances (RTECS), RTECS Number NH3486300, Review Date: May 2009.
- EPA - Sodium and Calcium Hypochlorite (Date 09/1991) Case# 0029 (RED; Factsheet)
<http://www.epa.gov/oppsrrd1/REDS/factsheets/0029fact.pdf>
- The Chlorine Institute website:
<http://www.chlorineinstitute.org/Bookstore/content.cfm?ItemNumber=3637&navItemNumber=3638> Pamphlet 96: *Sodium Hypochlorite Manual*

11. Contact Information: For additional information, call 1-800-752-5151 or 1-972-404-3700.

12. Preparation Date: December 2, 2009

This Product Stewardship Summary is intended to give general information about the product discussed above. It is not intended to provide an in-depth discussion of all health and safety information about the product or to replace any required regulatory communications.

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